

DECLASSIFIED FILES

THE SECRETARY OF STATE
WASHINGTON

Attention MR. TOLSON
Keep this study together.
HJB

June 20, 1969

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S/S - 8980

Dear Mr. Patterson:

Copies To:
J/PM
S/S-S:CMS

Thank you for the copy of the May 31st issue of the Saturday Review containing the interesting article by Joel Larus, "Nuclear Accidents and the ABM."

I appreciate your thoughtfulness in calling to my attention this indication of the opinions of interested persons on this vital aspect of our security posture.

Sincerely,

William P. Rogers

William P. Rogers

Mr. William D. Patterson,
Saturday Review,
380 Madison Avenue,
New York, New York

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MICROFILMED
BY S/S:CMS

J/PM:GB:rdt:mjs 6/17/69

DEPARTMENT OF STATE A/CDC/MR	
REVIEWED BY <i>Malcolm Jones</i>	DATE <i>7/15/80</i>
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DEPARTMENT OF STATE

Washington, D.C. 20520

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June 18, 1969

MEMORANDUM FOR THE SECRETARY

THROUGH: S/S *gfw*

FROM: J/PM - Howard Furnas *✓*

SUBJECT: Acknowledgment to Publisher of Letter
Forwarding a Copy of Saturday Review
ACTION MEMORANDUM

1. On June 4, 1969 Mr. William D. Patterson, publisher of the Saturday Review sent you a copy of the May 31 issue of that magazine drawing your attention to an article by Joel Larus on "Nuclear Accidents and the ABM."

2. At Tab A is a reply to Mr. Patterson acknowledging receipt of the magazine and advising that you have circulated the article to interested officials in the Department.

RECOMMENDATION: That you sign the letter at Tab A.

Attachments:

Tab A - Letter to Mr. Patterson

Tab B - Letter from Mr. Patterson

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J/PM:GB *rdt*:mjs 6/17/69

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June 4, 1969

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Dear Mr. Secretary:

This report is by a respected authority on the faculty of New York University. I hope you will find it of interest. Your comments, if any, would be appreciated.

With cordial regards,

Sincerely,

William D. Patterson

WDP:ng

Enc .

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Nuclear Accidents and the ABM

"... the Air Force admitted that ... four of the six safety mechanisms ... had moved to the 'go' position. In other words, only two safety systems remained in a locked position, and the remaining group of four had acted in a completely unscheduled and potentially dangerous fashion."

By JOEL LARUS

The current debate about the utility of deploying an anti-missile system to protect this country's deterrent capability has again raised a number of basic questions about the possibility and consequences of an American-caused nuclear weapons accident. Because the safety of our atomic and hydrogen arsenal relates so closely to top-secret command and control procedures, reliable information about U.S. anti-accident techniques and experiences is most difficult to obtain and even more ticklish to evaluate sagaciously. Yet the public fears the possibility of such incidents, and their anxiety is not assuaged by the events of recent years. Last fall, for example, when Washington announced that the Sentinel system was going to be located in Chicago, Detroit, Seattle, Boston, and New York, local residents determinedly challenged the wisdom of installing missiles close to urban centers when an inadvertent detonation of a nuclear warhead could not be discounted. One Congressman reports that this fear dominated all other considerations in the hundreds of letters he received from constituents protesting the Pentagon's decision.

The more recent announcement of the Nixon Administration that it

planned to deploy a limited ABM system, Safeguard, in the remote areas around the Minutemen silos, primarily in Montana and North Dakota, has lessened the general public's concern about nuclear weapons safety, but there is no reason for indifference or complacency. Even though the Safeguard system may be located in thinly populated states and not near leading industrialized centers, it does not necessarily follow that a mishap at such a site could not affect the lives and well-being of Americans residing in cities far from Montana and North Dakota. If an ABM accident should take place, the site of greatest probability is the area near the Safeguard system, but a computer running amuck or an unfavorable wind pattern could mean plutonium poisoning for many people hundreds of miles from the missile location.

One way to estimate the chance for an ABM failure and also to have some background information about the safety features of this country's nuclear arsenal, is to review our successes and failures in twenty-four years of watching over atomic and nuclear bombs (in military parlance, "safing the nukes"). When America's record of nuclear mishaps—"Broken Arrows"—is examined, one conclusion is inescapable: the human mind has been unable to construct a safety system for nuclear weapons that is accident-free, no matter how much time, money, and technological genius are as-

signed to the project. (According to military terminology, a Broken Arrow is any unplanned occurrence involving the loss of, destruction of, or major damage to a nuclear weapon or its components that results in an actual or potential hazard to life or property.) It is well to remember that mechanical and human failures are as much a part of the age of nuclear technology as mushroom clouds and fireballs.

There are two types of nuclear mishaps that could bring about accidental radioactivity. Most serious is the unauthorized, unintentional, or inadvertent nuclear explosion that results in a full-scale chain reaction. This type of detonation might be the result of a mechanical error, a human failure, or a combination of both, but no matter what the source of the accident there would be a Hiroshima-type explosion replete with the multifold problems of toxic radiation.

It is generally agreed that an American-sponsored accidental chain reaction detonation has a very low probability. In the years since the first atomic bomb was dropped, this country has produced thousands of nuclear weapons of all shapes, sizes, and yields. They have been transported about the entire world, and in the process they have been assembled, disassembled, inspected, loaded onto delivery vehicles, unloaded, checked and rechecked to maintain their efficiency. Squadrons of Americans of various temperaments and emotional

Joel Larus is professor of politics at New York University and the author of *Nuclear Weapons Safety and the Common Defense* (1967).

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characteristics have been trained to detonate both strategic and tactical systems under a variety of conditions and circumstances, many of which have not been especially conducive to the good mental health of the personnel involved. In spite of the innumerable opportunities for an accidental Hiroshima to have taken place, America's safety record insofar as this first category of possible failures is concerned has been perfect. The technicians who designed our safety controls (essentially a complex interacting arrangement of locks and switches that must be triggered in sequence) have established a safety record unequalled in the history of military technology.

Were it not for two Broken Arrow incidents that took place in 1960 and 1961 it would be possible to be even more sanguine about our future record of no-yield incidents. These accidents dramatically illustrate why there is always a possibility that as a result of extraordinarily bizarre circumstances there could be an accidental chain reaction.

In the Goldsboro, North Carolina, failure, which took place in January 1961, a SAC B-52 bomber on a training mission was carrying two 24-megaton bombs. The pilot, realizing that his plane was going to crash, had sufficient time to jettison one bomb. It was parachuted and landed in a field completely intact. There was no explosion of any type. A terse and uninformative Air Force press release stated that one of the unarmed nuclear devices the plane carried had been dropped safely by parachute and had been recovered undamaged. The second bomb was found in the plane's wreckage.

For the last eight years physicist Dr. Ralph Lapp has maintained that the Pentagon's investigation of the Goldsboro incident had revealed a frightening situation. He alleged that in falling to the earth five of the six interlocks built into the bomb had been set off and that only a single switch prevented the 24-megaton weapon from producing a yield detonation. Washington adamantly refused to offer any more particulars concerning the post-accident condition of the safety system. Recently the Air Force was forced to come clean

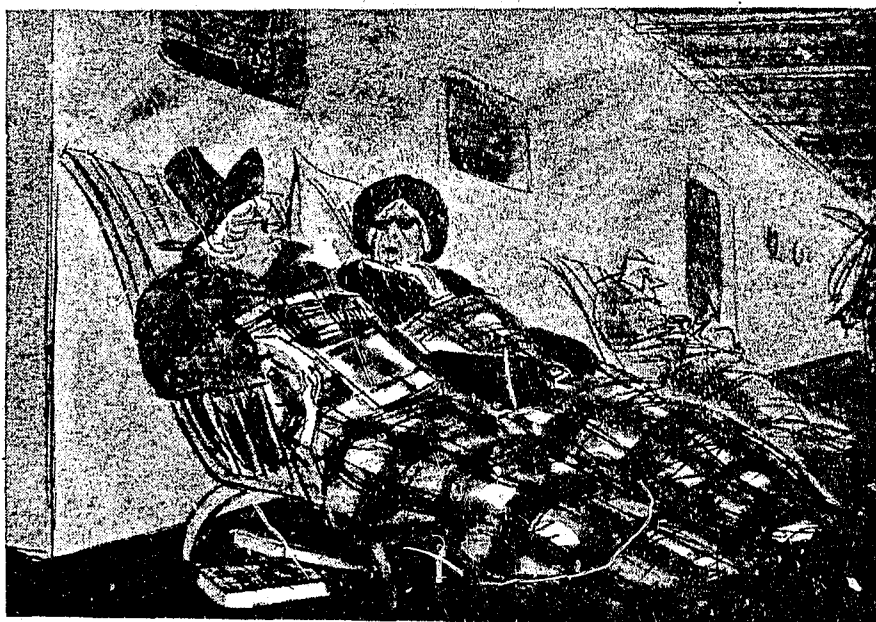
and reveal just how unpredictable mechanical safeguards on nuclear weapons can be, even those designed with infinite care and tested meticulously. Goaded by Congressman Sydney R. Yates of Illinois, who was determined to prevent the installation of the Sentinel system near Chicago, the House Appropriations Committee recently asked for an authoritative answer to the Goldsboro bomb mystery. In reply, the Air Force admitted that their inspecting teams in 1961 had found that four of the six safety mechanisms during the accident had moved to the "go" position. In other words, only two safety systems remained in a locked position, and the remaining group of four had acted in a completely unscheduled and potentially dangerous fashion. Pentagon and AEC officials prefer to call attention to the two devices that remained uncompromised, but a more relevant issue is to determine why there were so many failures and whether it can happen again.

An earlier Broken Arrow incident took place at McGuire Air Force Base (New Jersey) in June 1960. This accident is especially noteworthy in view of the extended debate about the reliability of the computer-programmed Safeguard system and its hair-trigger reaction time. If information availa-

ble from nongovernmental sources concerning the McGuire mishap is authentic—and in my opinion the source of the account is highly reliable—the incident highlights the problem of protecting an incredibly complex weapons system from being triggered by totally unexpected sources.

Some of the facts about McGuire are not in dispute. At 2:51 p.m. smoke and fire began to emerge from one of fifty-six Bomarc missile shelters. Two minutes later local fire crews arrived, and by 3:05 the entire missile complex was evacuated. For the next several hours, officers and enlisted personnel, reinforced by firemen from adjacent communities, fought heavy flames and smoke. According to *The New York Times's* account, the missile's propellant fuel ignited, its atomic warhead fell into the molten pool of fire, split open, and released radioactive material into the environment. The Air Force admits that radioactivity was present during the incident, but maintains that the fire started when a high-pressure bottle of helium exploded from unknown causes.

The uncorroborated version of the origin of the fire is considerably more alarming. This source alleges that while the Bomarc's crewmen were at dinner, they noticed that their unat-



"You can imagine my disillusionment when I discovered that a marquis corresponds roughly to our ward captain or county leader."

tended missile was preparing itself for an unauthorized launch. Rushing frantically to their station the men succeeded in aborting the erection. The account continues:

Even after detailed investigation there is no real understanding what series of factors caused the electronic brain controlling Bomarc firing . . . to issue the fire order to that nuclear weapon. The hypothesis is that a combination of the radio signals from passing police cars plus the tunes being played by a local disc jockey happened, in one of those occurrences of statistical probability, to combine into a signal that fed itself into the electronic brain as a fire order.

To date, the Defense Department declines to comment on this version of the McGuire accident.

As mentioned earlier, there is a second category of nuclear mishaps that can cause accidental radioactivity. In my opinion it has a much higher probability factor than the full-scale yield detonation accidents and consequently is the greater menace. It involves the nuclear bomb or missile that becomes ruptured when unusual energy inputs or physical stresses react unfavorably with the TNT component of the weapon. The heat or shock causes the TNT girdle enclosing the plutonium to explode, and the entire weapon blows apart. As soon as the integrity of the outer metal casing is destroyed, fissionable (not fissioned) material is strewn about the situs of the accident. Radioactive plutonium dust contaminates everything it contacts, and all human and animal life is endangered in this "hot" area.

Since 1945 the United States has caused an indeterminate number of

this type of accident. If the Pentagon's figure of thirteen nuclear weapons accidents is complete and accurate, this country has been responsible for one Broken Arrow incident every two years on the average since Hiroshima. If the tally is closer to twenty or twenty-two mishaps, as some non-governmental sources believe, this country has had approximately one potentially catastrophic emergency every year since the end of World War II. Whatever the exact number, there is no disputing the fact that American bombs or missiles that have been accidentally blown apart (but not detonated), have jeopardized the lives of residents of at least three countries, injured an unknown number of homes and factories, and contaminated the natural resources of at least three parts of the globe. No one has died or experienced lasting injury as a result of these Broken Arrows (at least not according to the unclassified information), but each failure exemplifies the radioactivity crisis that arises when a nuclear weapon scatters undetonated plutonium.

In January 1966, for example, four hydrogen bombs fell on Palomares, Spain, an isolated farming hamlet on the Mediterranean coast. Before this incident was over, the Defense Department and the Atomic Energy Commission, assisted by a small army of civilian experts, had staged the most expensive, intensive, harrowing, and feverish land and sea search for a man-made object in world history.

The accident took place when a B-52 on a training mission and a KC-135 tanker collided about 30,000 feet above the Mediterranean. Either a fire broke out in the tanker during the refueling mission and spread to the bomber, or

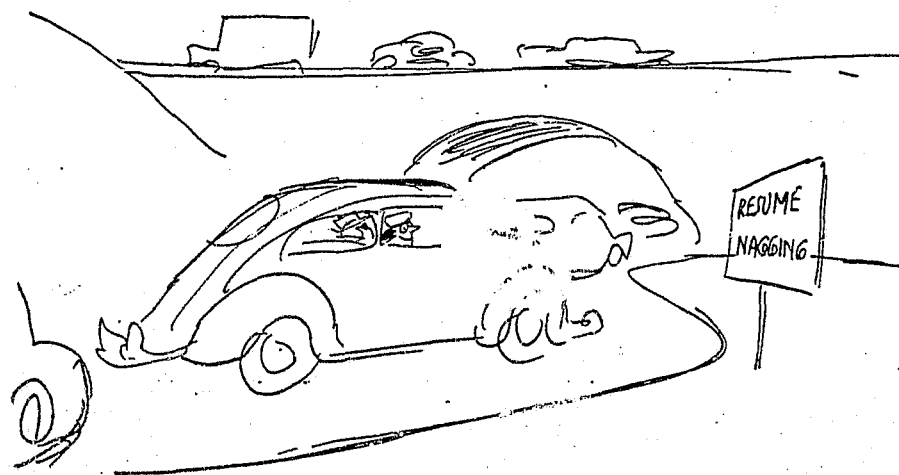
the planes failed to rendezvous properly. In any event, both planes plummeted to earth, scattering wings, fuselages, engine sections, wheel assemblies, and jet fuel over a wide area.

The four hydrogen bombs are believed to have been either the 20- or 25-megaton variety, and all were being transported in the customary unarmed condition. Each bomb landed in a different impact area in or about Palomares. One embedded itself in a dry river bed east of the village. It was found within hours after the crash and was undamaged except for some severe dents. It caused no radiation contamination problems. The second and third bombs slammed to the earth with such impact that the TNT exploded. Within seconds millions of particles of plutonium dust blanketed wide areas of Palomares.

Because plutonium is one of the most toxic substances known to man, American and Spanish authorities lost no time in beginning emergency clean-up operations. Plutonium has a half-life of 24,000 years, and the maximum permissible burden that the human system can tolerate is a speck-like amount described as two-billionths of a gram. Persons who inhale or ingest as little as 2/10,000ths of an ounce of plutonium dust can become deathly ill. As an added complication, alpha radiation from the plutonium is considerably more difficult to detect than any other type of radiation. An Air Force publication advised search teams to hold detection instruments one-eighth inch of the surface in order to obtain a counter reading. The it is nearly impossible to accurately count when plowed earth, wheat, gravel roads have to be checked for radiation exposure.

For the next three months the 234 families of Palomares became internationally famous as the soldiers, airmen, and civilians scoured the countryside for evidence of radiation contamination. The economy of the village all but collapsed because hundreds of pounds of tomatoes, which normally would have been sold throughout Spain, were thrown away or left rotting on the plants because the Geiger crews could not work quickly enough. Local farmers within a 640-acre zone were barred from entering their fields. Teams of medical specialists examined each man, woman, and child, testing in a variety of ways for traces of plutonium poisoning. Only a few of the local peasants could understand the situation; for the rest it was simply *el desastre*.

Before the land was returned to the



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owners, the United States had packed 1,750 tons of radioactive Palomares soil and vegetation into 5,000 sealed metal drums. The contaminated pieces of the two planes were similarly encased. This debris—the dung of the nuclear age—ultimately was brought back to the United States and buried in a nuclear graveyard in South Carolina.

The fourth hydrogen bomb that fell at Palomares caused even greater complications. This weapon came to rest about five miles offshore on a ledge 2,500 feet below the surface of the Mediterranean. A force of sixteen ships was assembled and included several midget submarines, scuba teams, underwater specialists, sonar experts, and oceanic photographers. For about eighty days the 3,000 men carried out this aspect of the recovery assignment. It was imperative that the fourth weapon be returned to American custody not only because of security considerations, but also because we needed to know if the bomb had ruptured and plutonium had contaminated the sea and its marine life. When brought to the surface on April 7, the bomb's outer casing was deeply dented but, miraculously, without a rupture. It is alleged that the underwater operation alone cost this country \$6 million.



"Look, Madam, go to Macy's. Give them a hard time."

The Palomares incident does not end with the recovery of all the bombs. In the succeeding three years press reports occasionally have told how the accident has changed life in the area. A battery of four Geiger counters still runs continuously to monitor the region for signs of plutonium radiation. Each villager continues to receive \$66 per month if he permits Spain's Nuclear Energy Committee to check his body daily for evidence of overexposure to radiation. Up to now the farmers have received \$700,000 on various claims they presented to the United States, and eleven cases are still pending. What cannot be altered with American bounty is the attitude that the Spanish people now have about the village and its farm products. All that grows in Palomares is suspected of being radioactive, and so there is no market for its fruits and vegetables. Fifty per cent of the people are reported to have been forced to migrate to more attractive farm areas. According to one resident, life has gone from the town and within a few years it will be quite empty.

The most recent Broken Arrow to be reported took place in January 1968 near a runway at the Thule Air Force Base in northern Greenland. A B-52 crashed and exploded while attempting to make an emergency landing. The plane admittedly was carrying four 10-megaton hydrogen bombs. On impact all broke into fragments and scattered

plutonium over the frozen surface of North Star Bay. Winds up to 27 miles per hour, temperatures in the 20-30 degree-below-zero range, daylight for only three or four hours at a spell, and continual swirling snows and Arctic storms added to the general emergency situation. In fact, this recovery operation was carried out on the most inhospitable site yet encountered by a Broken Arrow task force. The impact area was about a mile long and half-a-mile wide. Within this region were found thousands of pieces of the plane, all highly radioactive and dangerous to the body.

Immediately following news of the crash there was considerable concern that plutonium might have entered the ice and waters of the bay. The Danish government placed a prohibition on all fishing in the seas near the accident site, and this restriction lasted for three months. In addition, it banned local fox hunters from any trapping whatsoever in the Thule area, and this order remained in force for nine months. Available sources do not mention what steps were taken to protect the Eskimos from eating the meat of seals, walrus, and polar bears, but presumably such procedures were necessary because these animals might have been contaminated from eating radioactive marine life.

As in all Broken Arrow mishaps, the

most complex and costly problem is cleaning the ground area so that it is no longer "hot." At Thule, tons of radioactive snow and ice were an immediate hazard and had to be removed and secured. Teams of men were assigned the task of gathering the snow, ice, and the remains of the B-52 for shipment to the United States.

The main reasons why Congress should not authorize the Safeguard system have been explained at length elsewhere and need only be reviewed here. They are 1) that the ABM deployment could escalate the arms race at a time when there may be a real opportunity to achieve a nuclear détente with the Russians; 2) that the system is predicated on invalid assumptions concerning the strategic options open to the Chinese and Russians in the coming decade; and 3) that the estimated \$6-to-\$7-billion cost of the system ought to be used to help remedy our domestic problems. A fourth reason against the ABMs has been offered here: Nuclear weapons have a propensity to become involved in human and mechanical error situations, and when these Broken Arrow mishaps take place, the impact area and its environs are contaminated with toxic plutonium. The deployment of more nuclear weapons than is unacceptably necessary to maintain America's deterrent posture is unwise because it invites future accidents.

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